

CLAIMS

1. An evaporation leak diagnostic device for detecting a fuel vapor leak in an internal combustion engine having an evaporation purge system that includes a fuel tank and a communicating tube, which connects a canister for adsorbing and retaining fuel vapor to an intake pipe, the evaporation leak diagnostic device comprising:

pressure detection means for detecting the pressure of the evaporation purge system;

shutout means for shutting out the evaporation purge system from atmospheric air;

a pump for pressurizing or depressurizing the evaporation purge system; and

leak judgment means for driving the pump while the shutout means shuts out the evaporation purge system from atmospheric air, stopping the pump when the pressure detected by the pressure detection means reaches a predetermined level, and formulating a leak judgment in accordance with the time for driving the pump and a pressure change encountered after pump stoppage.

2. The evaporation leak diagnostic device according to claim 1, wherein the leak judgment means formulates a leak judgment while the internal combustion engine is stopped.

3. The evaporation leak diagnostic device according to claim 1, wherein the leak judgment means formulates an abnormality judgment for indicating the existence of a leak only when the time for driving the pump is longer than threshold pump drive time and the pressure change encountered after pump stoppage is greater than a threshold

pressure change, and formulates a normality judgment for indicating the nonexistence of a leak under the other conditions.

4. The evaporation leak diagnostic device according to claim 3, wherein the leak judgment means sets the threshold pump drive time and the threshold pressure change in accordance with the amount of fuel remaining in the fuel tank at the time of leak judgment.

5. The evaporation leak diagnostic device according to claim 1, wherein the shutout means closes the evaporation purge system while the internal combustion engine is stopped; and wherein the function for formulating a leak judgment is disabled when the pressure change measured without driving the pump is greater than a predetermined value.

6. The evaporation leak diagnostic device according to claim 1, wherein the leak judgment means estimates the charge amount of vapor adsorbed by the canister; and wherein, if the estimated charge amount is greater than a predetermined value, the function for leak judgment is disabled without driving the pump.

7. An evaporation leak diagnostic device for detecting a fuel vapor leak in an internal combustion engine having an evaporation purge system that includes a fuel tank and a communicating tube, which connects a canister for adsorbing and retaining fuel vapor to an intake pipe, the evaporation leak diagnostic device comprising:

pressure detection means for detecting the pressure of the evaporation purge system;

shutout means for shutting out the evaporation purge system from atmospheric air;

a pump for pressurizing or depressurizing the evaporation purge system; and

leak judgment means for driving the pump for a predetermined period of time while the shutout means shuts out the evaporation purge system from atmospheric air, and formulating a leak judgment in accordance with the amount of pressure change that the pressure detection means detects during pump drive and the amount of pressure change during a predetermined period of time after pump stoppage.

8. The evaporation leak diagnostic device according to claim 7, wherein the leak judgment means formulates a leak judgment while the internal combustion engine is stopped.

9. The evaporation leak diagnostic device according to claim 7, wherein the leak judgment means formulates an abnormality judgment for indicating the existence of a leak only when the amount of pressure change during the pump drive is greater than a threshold pressure change during the pump drive and the amount of pressure change during a predetermined period of time after pump stoppage is greater than a threshold pressure change after pump stoppage, and formulates a normality judgment for indicating the nonexistence of a leak under the other conditions.

10. The evaporation leak diagnostic device according to claim 7, wherein the leak judgment means sets the pump drive time in accordance with the amount of fuel remaining in the fuel tank at the time of leak judgment.

11. The evaporation leak diagnostic device according to claim 7, wherein the leak judgment means estimates the charge amount of vapor adsorbed by the canister and corrects the pump drive time setting in accordance with the estimated charge amount.

12. The evaporation leak diagnostic device according to claim 11, wherein the leak judgment means estimates the charge amount in accordance with a temperature history of the fuel tank.

13. The evaporation leak diagnostic device according to claim 7, wherein the leak judgment means estimates the amount of vapor generation in the fuel tank and corrects the pump drive time setting in accordance with the estimated amount of vapor generation.

14. The evaporation leak diagnostic device according to claim 7, wherein the shutout means closes the evaporation purge system while the internal combustion engine is stopped; and wherein the function for formulating a leak judgment is disabled when the pressure change measured without driving the pump is greater than a predetermined value.

15. The evaporation leak diagnostic device according to claim 1, wherein the leak judgment means estimates the charge amount of vapor adsorbed by the canister; and wherein, if the estimated charge amount is greater than a predetermined value, the function for formulating a leak judgment is disabled without driving the pump.

16. An evaporation leak diagnostic method for detecting a fuel vapor leak in an internal combustion engine having an evaporation purge system that includes a fuel tank and a communicating tube, which connects a canister for adsorbing and retaining fuel vapor to an intake pipe, the evaporation leak diagnostic method comprising the steps of:

causing pressure detection means to detect the pressure of the evaporation purge system;

causing shutout means to shut out the evaporation purge system from atmospheric air;

driving a pump for pressurization or depressurization purposes while the shutout means shuts out the evaporation purge system from atmospheric air;

stopping the pump when the pressure detected by the pressure detection means reaches a predetermined level; and

formulating a leak judgment in accordance with the drive time for the pump and a pressure change encountered after pump stoppage.

17. The evaporation leak diagnostic method according to claim 16, wherein a leak judgment is formulated while the internal combustion engine is stopped.

18. The evaporation leak diagnostic method according to claim 16, wherein an abnormality judgment is formulated to indicate the existence of a leak only when the drive time for the pump is longer than threshold pump drive time and the pressure change after pump stoppage is greater than a threshold pressure change; and wherein, under the other conditions, a normality judgment is formulated to indicate the nonexistence of a leak.

19. An evaporation leak diagnostic method for detecting a fuel vapor leak in an internal combustion engine having an evaporation purge system that includes a fuel tank and a communicating tube, which connects a canister for adsorbing and retaining fuel vapor to an intake pipe, the evaporation leak diagnostic method comprising the steps of:

causing pressure detection means to detect the pressure of the evaporation purge system;

driving a pump for a predetermined period of time to pressurize or depressurize the evaporation purge system while shutout means shuts out the evaporation purge system from atmospheric air; and

formulating a leak judgment in accordance with the amount of pressure change that is detected by the pressure detection means during pump drive and the amount of pressure change during a predetermined period of time after pump stoppage.

20. The evaporation leak diagnostic method according to claim 19, wherein a leak judgment is formulated while the internal combustion engine is stopped.

21. The evaporation leak diagnostic method according to claim 7, wherein an abnormality judgment is formulated to indicate the existence of a leak only when the amount of pressure change during the pump drive is greater than a threshold amount of pressure change during the pump drive and the amount of pressure change during a predetermined period of time after pump stoppage is greater than a threshold amount of pressure change after pump stoppage; and wherein, under the other conditions, a normality judgment is formulated to indicate the nonexistence of a leak.

22. An internal combustion engine control device for adjusting the amount of fuel injection for engine startup in accordance with fuel properties, the internal combustion engine control device comprising:

pressure detection means for detecting the pressure of an evaporation purge system that includes a fuel tank and a communicating tube, which connects a canister to an intake pipe;

shutout means for shutting out the evaporation purge system from atmospheric air; and

a pump for depressurizing the evaporation purge system, wherein fuel properties are judged in accordance with a pressure change that is encountered when the pump is driven with the evaporation purge system closed; and

wherein the amount of fuel injection for engine startup is adjusted in accordance with the fuel properties.

23. The internal combustion engine control device according to claim 22, wherein a fuel property judgment is formulated immediately after vehicle stoppage or when the fuel tank temperature is high.

24. The internal combustion engine control device according to claim 22, wherein, when the pressure change during pump drive is greater than a predetermined standard value for heavy gasoline or when the pump drive time required before a predetermined pressure is reached is smaller than a predetermined standard value for heavy gasoline, the fuel in the fuel tank is judged to be light so as to select a startup fuel injection amount that is smaller than for heavy gasoline.